The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

Sub b1

~~1. An electrical interconnection system comprising:~~

~~a rotary transformer for coupling to a first electrical system and to a second electrical system;~~

~~a controller which adjusts an angular position of the rotary transformer.~~

Sub b2

~~2. The system of claim 1, wherein the controller adjusts an angular position of the rotary transformer so that a predetermined power is transferred from the first electrical system to the second electrical system.~~

~~3. The system of claim 2, wherein the controller comprises:~~

~~a first control unit which compares an input order power signal P_o to a measured power signal P_1 being transferred between the first electrical system and the second electrical system to generate a requested angular velocity signal ω_o;~~

~~a second control unit which compares the requested angular velocity signal ω_o to a measured angular velocity signal ω_r of the rotary transformer to generate a drive signal T_o.~~

3. ~~4~~. The system of claim 1, wherein the controller has a bandwidth chosen to dampen inherent oscillations in the interconnection system.

4. ~~5~~. The system of claim 1, wherein the first electrical system and the second electrical system are a respective

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first electrical utility company and a second electric utility company.

Sub B2

~~6. The system of claim 1, wherein the rotary transformer comprises:~~

~~a rotor connected to the first electrical system;~~

~~a stator connected to the second electrical system;~~

~~and wherein the interconnection system further comprises an torque control unit for rotating the rotor.~~

6. ~~7~~. The system of claim 5 ~~6~~, wherein the controller controls the torque control unit whereby the rotor is rotated at a variable speed.

7. ~~8~~. The system of claim 6 ~~7~~, wherein the controller controls the torque control unit whereby the rotor is bi-directionally rotated at a variable speed.

Sub C3

~~9. The system of claim 6, wherein the torque control unit is a motor, and further comprising a gear for interfacing the motor with the rotor.~~

9. ~~10~~. The system of claim 8 ~~9~~, wherein the gear is a worm gear.

Sub C4

~~11. The system of claim 6, wherein the torque control unit is integrated with the stator and the rotor.~~

11. ~~12~~. The system of claim 10 ~~11~~, wherein the torque control unit is integrated with the stator and the rotor in a squirrel cage inductor configuration.

12. ~~13~~. The system of claim 10 ~~11~~, wherein the torque control unit is integrated with the stator and the rotor in a DC-excited rotor synchronous configuration.

13 ~~14~~. The system of claim 10 ~~11~~, wherein the torque control unit is integrated with the stator and the rotor in a wound rotor AC configuration.

Sub B3

~~15. A substation for electrically interconnecting a first electrical system and to a second electrical system, the first electrical system and the second electrical system having a differing electrical characteristic, the substation comprising:~~

~~a step-down transformer coupled to the first electrical system;~~

~~a step-up transformer coupled to the second electrical system;~~

~~a rotary transformer coupled to the step-down transformer and to the step-up transformer;~~

~~a controller which adjusts an angular position of the rotary transformer so that a predetermined power is transferred from the first electrical system to the second electrical system.~~

15. ~~16~~. The system of claim 14 ~~15~~, wherein the controller bi-directionally operates the rotary transformer at a variable speed for transferring power from the first electrical system to the second electrical system.

Sub B4

~~17. The system of claim 15, wherein the rotary transformer comprises:~~

~~a rotor connected to a first of the step-down and step-up transformers;~~

~~a stator connected to a second of the step-down and step-up transformers;~~

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and wherein the interconnection system further comprises an torque control unit for rotating the rotor.

~~18~~ 17. The system of claim ~~17~~ 16, wherein the controller controls the torque control unit whereby the rotor is rotated at a variable speed.

Sub C6

19. The system of claim 17, wherein the torque control unit is integrated with the stator and the rotor.

20. The system of claim 19, wherein the torque control unit is integrated with the stator and the rotor in a squirrel cage inductor configuration.

21. The system of claim 19, wherein the torque control unit is integrated with the stator and the rotor in a DC-excited rotor synchronous configuration.

22. The system of claim 19, wherein the torque control unit is integrated with the stator and the rotor in a wound rotor AC configuration.

23. The system of claim 15, wherein the controller comprises:

a first control unit which compares an input order power signal P_o to a measured power signal P_1 being transferred between the first electrical system and the second electrical system to generate a requested angular velocity signal ω_o;

a second control unit which compares the requested angular velocity signal ω_o to a measured angular velocity signal ω_r of the rotary transformer to generate a drive signal T_o.

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18. 14

24. The system of claim 15, wherein the controller has a bandwidth chosen to dampen inherent oscillations in the interconnection system.

Sub B5

25. An electrical interconnection system comprising:

a rotary transformer for coupling to a first electrical system and to a second electrical system;

a closed loop angular positioning control system which operates the rotary transformer for transferring power from the first electrical system to the second electrical system.

24. 23

26. ~~The system of claim 25, wherein the controller has a~~ bandwidth chosen to dampen inherent oscillations in the interconnection system.

Sub B6

27. A method of interconnecting two electrical systems, the method comprising:

coupling a rotary transformer to a first electrical system and to a second electrical system;

adjusting an angular position of the rotary transformer so that a predetermined power is transferred from the first electrical system to the second electrical system.

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28. The method of claim 27, further comprising:

comparing an input order power signal P_o to a measured power signal P_1 being transferred between the first electrical system and the second electrical system to generate a requested angular velocity signal ω_o;

comparing the requested angular velocity signal ω_o to a measured angular velocity signal ω_r of the rotary transformer to generate a drive signal T_o.

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